SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 964---Vol. XXIV.] LONDON, SATURDAY, FEBRUARY 11, 1854. [GRATIS.

OLD IN ENGLAND, AND BERDAN'S MACHINE.

e great and universal interest which is at the present moment felt cting recent discoveries of gold in England, justifies an attempt on art to place the subject before our readers in the light of all the evi- which we have been able to bring to bear upon it.

e observed at the outset that the existence of gold in various parts of Britain has long been known and conceded; but this knowledge oncession have been accompanied by a disbelief in its existence in quantities as to enable it to be worked at a profit. Nor has this on been formed until after the expenditure of large sums of money attempt to accomplish the desired object. The obstacle in the way has been the same which has entailed upon the workers of the rich f other countries the loss of a third to a half of the precious metal contained—viz., the imperfection of the processes adopted to secure The difference in favour of the foreign gold miner is that the ores he are rich enough to pay for working, notwithstanding the loss, while English ores require to be worked by more perfect processes in order ield profitable returns.

is a remarkable fact in the history of human ingenuity that, notwith- ing the general diffusion of gold-bearing ores throughout the world, he long ages in which gold has been the great object of human de- nd effort, the problem of the complete and economical reduction of rous minerals so long remained unsolved. A great many attempts been made, and processes more or less efficient have been adopted, one of them have approached complete success. All the plans, r for washing, smelting, or amalgamation, have equally failed to a perfect result. In washing, a considerable portion of the metal with the waste water. In amalgamating, which involves pre- pulverisation, the ore was not ground to sufficient fineness, and was oroughly brought into contact with the mercury. The result of imperfections was a loss of a large portion of the gold known, by , to exist in the ores.

is difficulty, so fatal hitherto to the successful and profitable working ld ores in this country, has, we believe, been completely removed by mproved process which a recent invention has brought to bear upon educing operation.

October last Mr. Berdan, an American engineer, from New York, ht to London his remarkable invention, set it at work at the Windsor works, City-road, invited all interested in gold mining to see its ope- n, and test its capability, claiming that it would, at a single opera- extract all the gold from the rock, that it lost no mercury in the tion, that 3 dwts. per ton would pay all expenses of extraction, and g to place the entire control of the machine in the hands of any table and responsible parties who might desire to test its powers.

ese claims and these offers were received by the English public with characteristic caution; but the inventor seemed in no haste to have ims admitted, confident that the practical operation of the machine best vindicate them. He went quietly to work, testing all ores ere brought, until the quantity became so great, and the applica- for trials so numerous, that he was obliged to protect himself by a But we anticipate: a public exhibition of the machine was first given e 25th of October last, which was attended by a large number of ific and other gentlemen. On this occasion, Mr. John Mitchell, F.C.S., mployed by the proprietors of the Cwmheisian Mines to superintend eration of the machines upon their ores. The following is the re- f Mr. Mitchell:—

Assay Office, Dunning's-alley, Bishopsgate, Oct. 27.

NTLEMEN,—In accordance with your request, I beg to hand you a ent of the experiment made under my superintendence, at the or Iron-works, City-road, on Tuesday, the 25th inst., with Berdan's pulverising, washing, and amalgamating machine, and a parcel of m the Cwmheisian Mines.

ore was quartz, mixed with blende, mundic, copper pyrites, and ; it was broken into small pieces, varying in size from 1 in. to 2 in. , and carefully washed with water to remove any particles of gold ight be adhering; its weight was then ascertained, and found to lbs.

machine was then carefully cleansed, and about 30 lbs. of mercury into it. The apparatus was then set in motion, and after revolv- about five minutes was stopped, a portion of the mercury removed, served to be tested for gold.

machine was again set in motion, and the ore gradually shovelled operation continued for three minutes, and was stopped for want m; after a time motion was again communicated, and in 16 minutes hole of the ore had passed into the machine, thus completing the ng and amalgamating of 320 lbs. of ore in 19 minutes. The appa- was kept in motion for some time after this, but the quantity of ore ed on required but the 19 minutes, as just stated.

the stoppage of the machine, the mercury (but not quite all) was d, washed, to separate sand, and strained—a quantity of solid gold m resulted, which fused in the usual way, furnished a button of eighing 5 dwts. 16 grs. = 1oz. 19 dwts. 16 grs. per ton of ore of . The button of gold thus obtained was reserved for after ex- nt. * * *

ing thus stated the course of the experiment, I will now give the as per assay:—

The sample of mercury from the machine contained *no gold.*

The tailings from the sluice-pit gave *no gold.*

nd lastly. The gold obtained from the amalgam is perfectly *pure gold.*

the precautions taken during the course of the experiment, the sults may be thoroughly relied on; and I am of opinion that Mr. 's machine fully accomplishes all that he claims for it, and that best crusher and amalgamator yet introduced to the public.

JOHN MITCHELL, F.C.S.

s. Johnson and Mathey and Mr. J. Calvert examined the tailings s experiment, and certified that they contained no gold.

proprietors of the Cwmheisian Mines made various experiments upon their ores, some of which were superintended by Mr. Calvert, who gave a report, from which we make the following extracts:—

Strand, Nov. 11.

Pursuant to your request, I this day attended at the Windsor Iron-Works, in the City-road, to ascertain the efficiency of Mr. Berdan's pulverising, washing, and amalgamating machine, as applied to the reduction of gold ores, and with particular reference to its application to sulphurets of iron, upon which the amalgamative processes have hitherto proved unsuccessful. * * * *

My observations will be limited to the operation of the machine, as exemplified in the experiments which were carried on under my direction.

On the premises were some ores supplied from your mines at Cwmheisian, and of which two portions were formed by weight, each 748 lbs., so as to be nearly one-third of a ton, for the convenience of description in the results. One lot consisted of sulphuret of iron, rough from the mine; the other, of a silver-lead ore, mixed with quartz and spar, and in the same condition. The two lots were operated upon at the same time.

About 20 lbs. of mercury was put into each cast-iron basin, which was then fed with ore during about thirty minutes, each basin being capable of working up about 1 ton of ore per hour, from which the capacities of the several machines may be calculated. The ore was adequately pulverised. The grand point at which this machine has the advantage of every other is the combined and simultaneous operations of several concurring causes, which, whether originally so designed or not, are most efficacious in producing an instantaneous and perfect result. * *

All these influences combined necessitate a rapid amalgamation of the gold with the mercury, and the most perfect amalgam is the result.

The result of the experiment on the silver-lead ore was a produce of 12 dwts. 6 grs. of gold, of 20 carats fine, on a quantity of 748 lbs. of ore, being equivalent to 1 oz. 16 dwts. 18 grs. per ton.

The result on the sulphuret of iron was 7 dwts. 5 grs. of gold, of 23 carats fine, being equivalent to 1 oz. 1 dwt. 15 grs. per ton. From this experiment I feel satisfied, not only as to the applicability of the machine to the sulphurets, but as to its general capability of reducing ores, having surmounted what is esteemed the most difficult combination of gold—viz., with the sulphurets of iron. This class of ores consequently becomes available for mining enterprise, and a great addition is made to our mineral resources, as I have already had the means of ascertaining that England is particularly rich in these ores. Of course, in a less special degree, a machine so efficient must be the means of producing equivalent results in our gold ores generally, and thereby materially aiding what will rapidly become an important branch of enterprise and wealth.

It is an incidental confirmation of the accuracy of these results, and one in which I was particularly interested, that the quality of the gold produced from the respective ores was in conformity with the characteristics which I have ascertained to belong to them, and of which those engaged in the operative process could not be cognisant. It will be observed, that whilst the silver-lead ore was of higher produce, the sulphuret of iron gold was of greater purity; and this is a peculiarity which I have recognised wherever gold is brought in contact with iron. In the other ore, the gold will have derived from the silver-lead a portion of its silver, which will account for its being below standard. JOHN CALVERT.

The following letters show the results of other trials:—

Vernon House, Pall Mall, London, Nov. 17, 1853.

DEAR SIR,—I have great pleasure in mentioning that the gold produced by your machine, on Friday last, was 1 carat $\frac{2}{24}$ grain above standard, from the Cornish quartz, and 1 carat $\frac{7}{24}$ grain above standard, from the Devonshire quartz. The yield of gold from the Cornish ore was equivalent to 11 ozs. 13 dwts. 8 grs. per ton; and the yield of the Devonshire ore was 9 ozs. of gold to the ton. C. M. BUTT.

To H. Berdan, Esq.

Britannia Company, Barge-yard Chambers, Nov. 18, 1853.

DEAR SIR,—We are happy to congratulate you on the complete success of your machine on our gossans; the following are the results of the experiments as made under our entire supervision:—

First trial, ½ ton of mixed gossans produced 7 dwts., equal to 14 dwts. per ton. The second trial was made with 1 ton of our average gossans, which produced 1 oz. 20 grs. We are fully satisfied that your machine extracts all the gold. We have had six assays made of the same gossans, and the results we produced with your machine are quite equal to the average of our assays. We shall proceed without delay to lay this matter before our shareholders at our next general meeting, which will be held on Wednesday, the 7th December next. You are at liberty to make what use you think proper of this communication.

JOSEPH CARY, Chairman.
ROBERT J. BISDEE, Sec. and Purser.

To Mr. Berdan.

Vernon House, Pall Mall, Nov. 21, 1853.

DEAR SIR,—The gossan which you were good enough to reduce and amalgamate, on Saturday, was from the Bamfylde, the mining sett adjoining the Poltimore south, and is likewise on the property of Lord Poltimore, in the parish of North Molton, county Devon.

The quantity of gold from the 8 cwts. of gossan was 9 dwts. 5 grs., and equivalent, therefore, to about 1 oz. 3 dwts. per ton. Its purity is 23½ carats. I feel convinced that this gossan could be raised and reduced by your machine at the mine for less than 3 dwts. per ton.

It is with much pleasure that I have this opportunity of again testifying to the great merits and efficiency of your machine. C. M. BUTT.

To H. Berdan, Esq.

Vernon House, Pall Mall, Nov. 29, 1853.

DEAR SIR,—On the part of the committee of management of the above company, I beg to enclose the particulars of the various experiments publicly made by your machine on the Poltimore gossan; and at the same time I have the pleasure to add, that the committee and all the shareholders present beg to express their entire satisfaction and confidence in its efficacy to effect the reduction and amalgamation of auriferous ores, and fully believe that your machine performs all claims for it. The company will in all probability, in addition to the four machines already ordered, require many more. CHARLES HENEAGE,
Chairman of the Poltimore Company.

H. Berdan, Esq.

Result of Experiments made with Ores belonging to the Poltimore Copper and Gold Mining Company.

			grs.	dwts.	grs.	
Oct. 25.—400 lbs. red gossan gave of fine gold			126=29		9	per ton.
,, 444	,,	,,	136=28		14	,,
Nov. 3.—446 lbs. brown gossan		,,	74=17		13	,,
,, 436 lbs. red gossan		,,	156=32		8	,,
,, 840	,,	,,	320=35		13	,,

Winchester-buildings, Nov. 30, 1853.

DEAR SIR,—I herewith send you a report of the experiment made yesterday with your machine, upon some of the ores from Cwmheisian Mines. The experiment was highly satisfactory as regards the powers of the machine for crushing the ores and separating the gold, as well as for washing at the same time silver-lead ore. FREDK. A. CATTY.

Report on Experiment made with Mr. Berdan's Machine, Nov. 29, 1853.

Three cwts. of mixed ores from Cwmheisian Mines:—1 cwt. pyrites, 1 cwt. silver-lead ore, 1 cwt. quartz with galena and blende, were worked together in one pan, with 16 lbs. of mercury. At 22 minutes past 12 the man commenced shovelling in the ore, and in 14 minutes it had all passed into the pan, the machine working freely, and making 20 revolutions per minute. The quantity of fine gold, after separating the amalgam, was 5 dwts. 20 grs., or at the rate of 1 oz. 18 dwts. 19 grs. to the ton.

The wire-gauze was slightly out of order, and the tailings, which have not yet been examined, were not passed through the separator. The other pan was doing an equal amount of work. The ores used were exceedingly tough and tenacious. The operation was completed at 5 minutes past 1 o'clock, but the ore was all crushed within 20 minutes from the commencement of the operation. FREDK. A. CATTY.

The following are the results of other experiments made on, and since, the 29th November:—

For Mr. Alfred Smee, 22, Moorgate-street:—
73 lbs. ore gave 1 dwt. 18 grs. gold = 2 ozs. 13 dwts. 16½ grs. per ton.
411 lbs. ore yielded nothing.

For Irish Consols Company, 22, Moorgate-street:—
154 lbs. ore gave 1 dwt. 13 grs. gold = 1 oz. 2 dwts. 10 grs. per ton.
114 lbs. ore gave nothing.

For Mr. W. J. Valentine:—
225 lbs. ore gave 4 dwts. 5 grs. gold = 2 ozs. 1 dwt. 21 grs. per ton.
62 lbs. ore gave 1 dwt. 5 grs. gold = 2 ozs. 3 dwts. 15½ grs. per ton.
207 lbs. ore gave nothing.

For Mr. Edward Mullen, 5, Brunswick-square, Camberwell:—
No. 1—25 lbs. ore gave 18 grs. gold = 3 ozs. 7 dwts. 5 grs. per ton.
No. 2—42 ,, 21 ,, = 2 6 16 ,,
No. 3—107 ,, 2 dwts. 13 ,, = 2 13 5 ,,
150 lbs. ore gave nothing.

For Messrs. Wm. Henderson and Co., Smelting Works, Bow Common:—
3 cwts. ore gave 4 dwts. gold = 1 oz. 6 dwts. 16 grs. per ton.
44 lbs. ore only exhibited a trace of gold.

For Mr. John D. Brunton:—
42 lbs. Cornish ore gave 20 grs. gold = 2 ozs. 4 dwts. 10 grs. per ton.

The following experiments were made at the request of many persons interested in the Cornish tin mines, under the direction of their captains, to ascertain whether this machine would pulverise and wash the tin ore to better advantage than their present mode of obtaining the metal:—

Dec. 1.—For Wm. Thorne, Esq., Connaught-place, Hyde-park:—

	ozs.	dwts.	grs.	
East Wheal Golden produced gold	0	8	8	per ton.
Fat-works	1	0	20	,,
Wheal James	0	11	0	,,
Wheal George, called Stream Tin	0	13	0	,,
Virtuous Lady Mine	0	10	17	,,

Ores from three other tin mines were also tried, without obtaining any gold. It will be observed that these experiments were made *not* with the object or expectation of finding gold, but the results were as stated. The pulverising and washing of the tin ore was perfectly satisfactory to the gentlemen who tried the experiments.

A machine claiming to produce such astonishing results, and supported in its pretensions by the testimony of persons known to the English public, naturally attracted the attention of the Society of Arts. A model was shown at the annual exhibition, in November, and a paper, on the subject of ore-crushing, read before the society on the 23d of November, went fully into the qualities and merits of the machine. A discussion ensued, which resulted in the appointment of a committee to investigate the subject, and report upon the value of the invention. Mr. Berdan at once put the machine under the entire control of the committee, for the application of such tests as they might think proper. Mr. William Bird, of Laurence Pountney-hill, Cannon-street, Peter Le Neve Foster, Esq., secretary of the Society, and Prof. Ansted, were present at the trial, and the last-named gentleman prepared the report, which was accepted by the Society, and published in the Journal on the 10th of Dec. last. The following is the report, with the comments of the *Bankers' Circular* upon it:—

Report of Professor Ansted to the Council of the Society of Arts on Berdan's Gold Machine, with Comments.

In consequence of the difficulty of getting together, at a short notice, the Standing Committee on "Mining, Quarrying, Metallurgical Operations, and Mineral Products," the Council accept, with thanks, the following report from Prof. Ansted, F.R.S., one of the members of the committee:

SIR,—Before receiving your letter, and, indeed, before I was aware that a paper on Mr. Berdan's machine was in preparation, I had myself made an experiment on the machine, which, owing to some causes I need not mention, seemed incomplete. A partial trial had also been made in the presence of some directors of the Agua Fria Company, on some tailings belonging to Mr. Catherwood; and a further trial was proposed by me to be made, at the cost of the Agua Fria Company, for the purpose of determining, with something like accuracy, the positive and relative value of the process. On receiving your letter, I made an arrangement with Mr. Berdan to carry out our investigation on Monday, the 28th ult., and the trial then made became, at the same time, available for the Society and the company.

The experiments consisted of—1. The crushing and amalgamating of certain Californian ores, provided at my request by the directors of the Crystal Palace Company.—2. The crushing and amalgamating certain ores from North Devon, provided also at my request by the directors of the Poltimore Mining Company.—3. The ultimate analysis of tailings from each sample, conducted at the cost of the Agua Fria Company, by T. H. Henry, Esq., F.R.S. I had also provided other samples of ore from North Wales, and some tailings resembling those already previously but partially experimented on by Mr. Catherwood. These have not yet been operated on and analysed.

In order to obtain results as complete and satisfactory as possible, the machine was placed by Mr. Berdan at my absolute control, and the feeding was entrusted to two labourers, hired for the occasion, and who had never seen the machine. Owing to the latter cause some delay occurred in feeding, doubtless unfavourable to the machine. I was assisted in the investigation by Mr. Henry, who himself collected the tailings, and conveyed them to his laboratory. I had also the able assistance of Mr. J. S. Atkinson, a civil engineer, well acquainted with machinery, to whom I am indebted for a careful report on the power employed during the experiment, and who has assisted me also in obtaining an estimate of the probable working and general charges incidental to the use of the machine and engines required to work it.

Before commencing the experiments the basins, mercury reservoir, and

pit for tailings, were thoroughly cleaned out. Fresh mercury (about 15 lbs.) was put into each basin, and about 288 lbs. of mercury in the reservoir. It was observed that the gauzes through which the tailings pass away from the basins were in very indifferent condition, being partly cracked, and otherwise injured. During the experiment one of them was broken off, and the fragments mixed with the amalgam.

Experiment 1.—All preliminaries having been completed, the machine was started, and about ½ ton (10 cwts. 1 qr. 23 lbs. nett) of very hard, tough, auriferous quartz, from Gold Hill, Nevada County, California (now in the possession of, and being worked by, the Agua Fria Mining Company), was gradually supplied by hand, one-half in each of the two basins of the machine.*

The whole time of feeding was 1 hour 25 minutes, exclusive of a stoppage from over-feeding, owing apparently to the want of experience of the feeders. After the feeding was concluded, the basins were kept revolving for 24 minutes, and there still remained a considerable quantity of sand at the close of the operation. The arrangements for removing the plug, and emptying the basins, occupied 45 minutes. During the experiment, while the mill was in full operation, the average number of revolutions of the basins was 19 in the minute, and the average quantity of water delivered in each basin was 10 to 11 gallons per minute. On a careful estimate, the average power absorbed in working the two basins appeared to be 11·835 commercial horse-power, but probably nearly 1½-horse power was lost by the vibration of the cross beams, which have no bracing. In this experiment the quartz was extremely hard and tough, but was ground to a very fine powder. The amalgam being obtained from the mercury, and reduced, yielded 2 ozs. 11 dwts. 21 grs. of gold, whose fineness was 20 carats 3½ grs., equivalent to 4 ozs. 4 dwts. 21 grs. fine gold to the ton of ore. On an ultimate analysis of the tailings they were found to yield at the rate of 4 dwts. 5 grs. of fine gold to the ton; the machine obtained, therefore, 95·8 per cent. of the total amount of the gold contained in the ore.

Experiment 2.—The basins being perfectly clean, and the mercury again placed in them, a quantity, amounting to 8 cwts. 0 qr. 12 lbs. nett of the red oxide of iron, combined with some sulphuret, forming the gossan of the copper lodes at Poltimore, North Devon, was submitted to be crushed, one-half, as before, in each basin. This ore was much less hard than the Californian, and was partly in small lumps, partly in a red, soft, muddy state; it was a portion of about 1 ton, forwarded expressly from the mine to my address, for the purpose of experiment. I did not observe any visible gold in any part of the ore. The time occupied by the feeding with this ore was 29 minutes 30 seconds from the first to the last—the mill being kept going for 23 minutes 30 seconds after the feeding, after which the quantity of sand was not very considerable. The removal of the amalgam occupied 1 hour 23 minutes. During this experiment, the mean number of revolutions per minute was 19 *full*, the power absorbed being 12-horse, as nearly as could be estimated. The water was as in the former experiment. The springing of the cross beams was very marked. The ore in this case was ground finer than in the former, remaining a long time mixed with the water before subsiding. The amalgam being reduced yielded at the rate of about 1 oz. 12½ dwts. of gold to the ton of ore. The gold was apparently finer than the Californian, but the button was not assayed, nor was its weight accurately taken. The tailings of this ore yielded at the rate of 2 dwts. fine gold to the ton of ore, the per centage of gold obtained by the machine being 93.

In a former experiment it was determined, by analysis of the tailings, that the loss of mercury is extremely small. It appears likely that this loss does not exceed in weight that of the gold obtained.

The machine, in its present state (although certainly admitting of some improvements), is both simple and effective, and, although the basin and balls would probably require frequent replacement, it is not likely to get out of order. It requires no skilled labour, and might be entrusted to any responsible person altogether ignorant of gold working, and in this respect its advantages over any machine or process in actual use are equally certain and important. The per centage of gold obtained is decidedly very large, and from the near equality of this per centage in two ores, extremely different in nature, richness, and hardness, it would seem that the machine may be generally and safely employed on ores of average value, where the yield of gold is large enough to leave a profit on the cost of working.

We have next to consider the probable charge for working the machine. For this purpose it is fair to take the combination of four basins, recommended by the inventor, assuming the first cost and subsequent expenses under the least favourable circumstances. Such a combination I assume to require an engine of 25-horse power, and to work continuously, except when stopped for repairs or delivering the amalgam. Under these circumstances, it may fairly be considered that 15 tons of average stuff might be reduced per day by this machine, in England or Western Europe, at an average cost of 13s. 9d. per ton. In California the cost would hardly exceed 20s. per ton. I make no remark on this result, which will speak for itself to all those interested in gold working.

I append the details—1. Of the estimate of power absorbed during the experiment.—2. Of the estimate of cost of working in England.

To the Secretary of the Society of Arts. D. T. ANSTED.

APPENDIX 1.—*Calculation of Power.*

The drum on the mill, two basins, measured 5 ft. diameter, (15·70 circumference, and made 93·6 revolutions. The strap was 6 inches, and the pressure of strap, per square foot, being 150 lbs., the area of strap, effective, was 3·5 feet. We have, therefore,

$$\frac{3{\cdot}5 \times 150 \times 1469{\cdot}58}{33{,}000} = 23{\cdot}67 \text{ horse-power, estimate.}$$

$$= 11{\cdot}835 \text{ commercial horse-power.}$$

The power was somewhat greater in the second experiment, the revolutions being somewhat more rapid, so that the actual power could not have been much short of 12-horse. In both cases 1½ horse, or thereabouts, was wasted by the springing of the cross-beams and imperfections of connecting parts, so that 10½ might suffice. It would not, however, be safe to put a less power than 12-horse for a single pair, or 24-horse for four basins, and a slight excess of power would be desirable for pumping water, lifting ores, &c.

APPENDIX 2.—*Estimate of Cost and Charges.*

Cost of a nest of four basins	£2400	
Conveyance to mine, foundations and fittings, house, &c.	300	=2700
Cost of a 25-horse power engine, complete	1250	
Engine and boiler-house	150	=1400
Sundry incidental charges	100	
Annual Charges. Total cost of plant		£4200
Deterioration and replacement of machine, 60 per cent.		£1400
Ditto of engine and fittings, 10 per cent.		150
Interest on cost of plant, at 5 per cent.		210
Daily Charges. Total annual charges		£1800
Proportion of annual charges on each working day	£6	0 0
Wages and salaries, per day (working day and night)	2	10 0
Coal, 2½ tons, at 15s.	1	17 6
Oil, waste, tallow, tools, and sundries	0	2 8
Loss of mercury, and proportion of laboratory expenses	0	4 6
Spalling or crushing 16 tons, at 4d. per ton	0	5 4
Average daily charges	£11	0 0

The four basins, crushing and amalgamating not less than 16 tons on an average per working day, the mean cost would thus be 13s. 9d. per ton. This cost might be diminished by the introduction of a hopper (avoiding a heavy expense in wages), the combination of two or more nests in one establishment, and any improvements that would lower the annual deterioration of the machine.

PROF. ANSTED, AND BERDAN'S GOLD CRUSHING MACHINE.

From the *Circular to Bankers*, Dec. 17, 1853.

We have on a previous occasion given a brief notice of Mr. Berdan's gold ore-crushing machine. Since then this piece of machinery has attracted considerable notice in the scientific world, and Professor Ansted has placed the results of several experiments before the public. The first experiment was tried upon about ½ ton of very hard tough auriferous quartz from Gold Hill, Nevada County, California, belonging to the Agua Fria Company, which was sent over two years ago by Mr. Catherwood. In this experiment, the quartz, though extremely hard and tough, was ground to a very fine powder. The amalgam obtained from the mercury and reduced yielded 2 ozs. 11 dwts. 21 grs. of gold, of 20 carats 3½ grs. fine, which is equivalent to 4 ozs. 4 dwts. 21 grs. of fine gold to the ton of ore; and by an ultimate analysis of the tailings they were found to yield at the rate of 4 dwts. 5 grs. of fine gold per ton; consequently, the machine obtained 95·8 per cent. of the total quantity of gold contained in the ore. The second experiment was tried upon about 8 cwts. 12 lbs. of red oxide of iron, combined with sulphurets, forming the gossan of the copper lodes at Poltimore, North Devon. This ore was much less hard than that which was tried in the first experiment. The amalgam being reduced, it yielded 1 oz. 12 dwts. 10 grs. of gold to the ton of ore; and the gold appeared somewhat finer than the Californian, though it was not assayed. The tailings of this ore yielded at the rate of 2 dwts. of fine gold to the ton of ore, which gives the proportion of gold obtained by the machine at 93 per cent.; thus it appears that the results of the two experiments, although carried out upon ores entirely distinct in their nature, were nearly similar as to the proportion of gold obtained by the machine, or about 94 per cent. as the average. There appears to be one very important consideration in the use of this machine that deserves to be particularly noticed, which is the very small quantity of quicksilver lost in working it. This has hitherto greatly enhanced the cost of working ores which contain the precious metals. The principal point, however, to be ascertained is that which all men of business will be anxious to know, at what cost can the machine be worked, and whether it can be profitably employed in crushing the ores which are submitted to its operation; and upon this must depend the value of the machine in a commercial point of view. Before offering any remarks on this part of the question, we will give calculations made by Prof. Ansted, which are as follow. (For these calculations see the report).

Professor Ansted has made his calculations upon the above experiments, and has assumed the machinery to require an engine of 25-horse power, and to be worked continuously, except when stoped for repairs or delivering the amalgam, from which he estimates that 16 tons of average ore might be reduced per day in England or Western Europe, at an average cost of 13s. 9d. per ton; and that in California the cost would not exceed 20s. per ton.

Without attempting to depreciate the value of Professor Ansted's scientific inquiries, we may, perhaps, be permitted to offer a few remarks upon the practical part of his calculations. From the several enquiries we have made upon this point, we think his estimates are not put in the most favourable light as to the cost of working the machine; and this is far too important to be overlooked. We find that he has put the cost of wear and tear of the machine at 60 per cent., or 1440*l.* in the annual charges. Surely this must be a very extreme rate and if correct, the friction caused by the working must be already very considerable. But we understand that so far from this being the fact, there is scarcely any perceptible wear discoverable, though the machine has been at work upwards of two months. This seems to us to be the principal point in Professor Ansted's estimate to be correctly determined. For we cannot conceive, from the examination of the working of the machine, that it is possible that the annual deterioration can reach so high a proportion. Professor Ansted appears to ground his estimate upon the opinion, that the basin and balls would probably require frequent replacement. For he says of the machine itself, it is not likely to get out of order. We are induced, therefore, from his own remarks, to question the rate of 60 per cent. for deterioration and replacement of machine. We are also inclined to believe that the quicksilver acting upon the balls, and their moving in a circular direction, would contribute materially to diminish the wear and tear.

There appears, also, a great discrepancy between Professor Ansted's estimate of crushing power and the one we have seen by Mr. Readwin. The former fixes it at an average of 16 tons per day, with an engine of 25-horse power, while the latter gives it at 40 tons per day, with an engine of 16-horse power. The cost per ton is put down by Professor Ansted at 13s. 9d., while by Mr. Readwin it is stated to be 2s. 9d. per ton.

We wish to be distinctly understood, that in these remarks we do not for a moment question the utility of Mr. Berdan's machine, or undervalue Professor Ansted's scientific analyses; but the great difference which is found between the two estimates in the cost of working the machine seems to demand some explanation.

The report of Prof. Ansted removed the doubts of many who previously had little faith in the efficiency of the invention, and excited the interest of those who had been indifferent. The owners of mines in which gold was known to exist, determined to satisfy themselves by actual experiment of the value of their ores, and the capabilities of the invention for their reduction. The result has been the remarkable list of experiments which we are about to lay before our readers. The first trial of the machine in London, was made on the 22d day of October last, and from that day until the present it has been at work nearly every day, and during this period more than seven hundred different experiments have been made, many of them under the direction of scientific gentlemen, and mining companies.

Most of the experiments on the list subjoined have appeared at various times in the *Mining Journal*:—

150 lbs. from a new mine, produced nothing.
1000 lbs. of tailings of Agua Fria ore, after it had been operated upon by John Taylor and Sons, produced 5 dwts. = 11 dwts. 4 grs. to the ton.
1000 lbs. of tailings from the Poltimore Company, previously operated upon as above, produced 6 dwts. = 12 dwts. 1 gr. per ton.—the experiment was conducted by Messrs. Taylor and Sons' foreman.
200 lbs. of tailings from the Britannia Company, after being operated upon by their machinery, produced 1 dwt. = 11 dwts. 5 grs. per ton: 172 lbs. produced nothing.
Henderson and Co., from Scotland—27½ lbs. = 1 oz. 6 dwts. per ton.
Mr. Vatcher, of Exeter—32 lbs. = 1 oz. 15 dwts. to the ton: 56 lbs. produced a trace only: 100 lbs. produced nothing.
Mr. Readwin—192 lbs. produced 3 grs. = 1 dwt. 11 grs. to the ton.
300 lbs. of same produced 7 grs. = 2 dwts. 4 grs. to the ton.
500 lbs. of same produced 10 grs. = 1 dwt. 20 grs. to the ton.
Mr. Lourt, 2, Muscovy-court—420 lbs. from Wales, produced 10 dwts. 8 grs. to the ton
173 lbs. from Wales, produced 2 dwts. 11 grs. = 1 oz. 11 dwts. 19 grs. per ton.
Mr. Tippet—10 lbs. iron pyrites from Wheal Jane, in Cornwall, produced 10 grs. = 4 ozs. 13 dwts. 8 grs. per ton: 189 lbs produced nothing.
Mr. Readwin—250 lbs. of ore from Wales, produced 2 dwts. 3 grs. = 19 dwts. per ton.
44 lbs. of tin ore from Frome, yielded 14 grs., at the rate of 1 oz. 9 dwts. 16 grs.: 174 lbs. produced nothing.
368 lbs. produced 4 grs. = 1 dwt. per ton.
Arundell Copper Mine, Devon—857 lbs. produced 3 dwts. 6 grs. = 8 dwts. 11 grs. per ton: 100 lbs produced nothing.
J. C. Smith, 1, Old Broad-street—40 lbs. produced 2 dwts. 3 grs. = 5 ozs. 19 dwts. per ton.
Mr. Readwin—33 lbs. clay slate, produced 9 grs. = 1 oz. 5 dwts. 10 grs. per ton.
Mr Tippet—West Wheal Jane, 50 lbs. yielded 1 dwt. 2 grs. = 2 ozs. 8 dwts. 12 grs.—Wheal Jane, 65 lbs. yielded 1 dwt. 5 grs. = 2 ozs. 1 dwt. 15 grs.—Isemane, 18 lbs. yielded 15 grs. = 4 ozs. 13 dwts. 8 grs. per ton.

From the *Mining Journal*, Dec. 24:—

The samples of gold-bearing strata, tested by Berdan's machine during the week have been—

Quintrell Downs gossans, which we stated in last week's Journal cost but 4s. per ton raising to surface, and which has yielded at the rate of 3 ozs. 17 dwts. of gold to the ton.

Some mundic, from Tremollet Down Mine, is stated to have been assayed by Mr. J. Mitchell, and to have given the high produce of 8 ozs 0 dwt. 1 gr. per ton. This mundic exists in large quantities.

The Cubert United, 1 cwt. of gossan has been reduced, producing 1 dwt. 6 grs., equal to 1½ oz. to the ton; and a like quantity of mundic from the same mine, produce 1 dwt. 5 grs. = 1 oz. 4 dwts. 4 grs. per ton.

More than 200 samples of English, Irish, and Scotch ore, varying in quantity from 10 lbs. to 1 ton, have been reduced by Berdan's machine at the Windsor Iron-Works during the last two months. About two-thirds of the samples contained gold, and about one-half of the entire number contained an average of 35 dwts. to the ton.

From Wheal Fanny, 70 lbs. of gossan produced 1 dwt. 1 gr., equal to 1 oz. 12 dwts. 20 grs. per ton; the gossan is obtainable in larger quantities, and it is proposed to obtain and set to work two of Berdan's machines, at as early a period as possible.

Two experiments have been made on gossan from Boringdon Consols, one of 108 lbs. produced at the rate of 8 dwts. 8 grs. per ton; and the other, 50 lbs., at the rate of 11 dwts. per ton.

Some sulphuret of iron from the Dinas Great Copper Mine has also been tested, and found to produce 1 oz. 5 dwts. 13 grs. per ton. A sample of stuff from Castle Dinas Mine, taken under unfavourable circumstances, containing much of the "country," produced at the rate of 1 oz. 8 dwts. 11 grs. per ton. An enormous quantity of gossan can be raised from this and Dowser's lode, both of which are large, and run two miles through the sett. It is estimated that 10 machines can be kept at work; 100 lbs. yielded 1 dwt. 19 grs., equal to 2 ozs. 0 dwt. 8 grs. per ton; 200 lbs. yielded 1 dwt. 18 grs., equal to 19 dwts. 14 grs. per ton; and 112 lbs. produced a trace of gold.

Gossan from Exmouth and Adams United yielded after the rate of 1 oz. 2 dwts. per ton.

The Devon United Mining Company, whose gossan we last week stated produced 1¼ oz. per ton, have issued a report to the shareholders, congratulating them or the results, and estimating a profit from the present return of 3250*l.* per month; while the mundic, which is expected to prove much richer, will be immediately experimented upon. Mr. Vatcher, of Exeter, had another parcel of 554 lbs, of gossan tested, which gave 1 oz. 4 dwts. per ton.

Prof. Mitchell: 224 lbs. Welsh quartz, for Mr. Clay, 28, Bucklersbury, produced 1 dwt. 18 grs., equal to 17 dwts. 12 grs. per ton; 224 lbs. of Welsh quartz yielded 1 dwt. 20 grs., equal to 18 dwts. 8 grs. per ton

Mr. Thos. Gosse, of Bath: 20 lbs. of copper mundic produced 17 grs. of gold, equal to 3 ozs. 19 dwts. 3 grs. per ton; and 20 lbs. copper gossan produced 12 grs., equal to 2 ozs. 16 dwts. per ton

Mr. R. F. Head, of Exeter: 202 lbs. of red gossan produced 2 dwts. 2 grs., equal to 1 oz. 3 dwts. 2 grs. per ton; 200 lbs. of lead ore produced nothing; 200 lbs. iron pyrites produced nothing; 91 lbs. gossan produced 12 grs., equal to 12 dwts. 7 grs. per ton; 51 lbs. lead ore yielded 12 grs. equal to 1 oz. 1 dwt. 23 grs.; 100 lbs. gossan produced no gold

Mr. Fuller, 51, Threadneedle-street: 112 lbs. yielded 1 dwt. 6 grs., equal to 1 oz. 6 dwts. per ton

A new mine: 300 lbs. of ore yielded no gold

South Wheal Jane: 100 lbs. of gossan yielded 1 dwt. 13 grs., equal to 1 oz. 14 dwts. 12 grs. per ton; 100 lbs. mundic yielded 13 grs., equal to 12 dwts. 3 grs. per ton; 100 lbs. mundic, result not ascertained, on account of metallic arsenic in the amalgam

Mr. A. Francis: 100 lbs. mundic yielded nothing

Mr. Manuel: 69 lbs. gossan yielded equal to 2 ozs. 15 dwts. per ton; 108 lbs. mundic yielded nothing

Messrs. Millett and Bennett: 168 lbs. yielded equal to 2 dwts. 10 grs. per ton; 150 lbs. limestone yielded nothing

Mr. Lebon; 95 lbs. yielded 1 dwt. 2 grs., equal to 1 oz. 5 dwts. 13 grs. per ton; 83 lbs. yielded nothing

Mr. Cash, of 26, Throgmorton-street: 200 lbs. of copper quartz from Cornwall produced 1 dwt. 18 grs., equal to 19 dwts. 14 grs. per ton

Mr. Watson: 167 lbs. copper quartz and gossan yielded 20 grs., equal to 11 dwts. 4 grs. per ton

Mr. Young, on behalf of Mr. William Thorne: 80 lbs. from Cornwall yielded 1 gr., equal to 1 dwt. 4 grs. per ton; 126 lbs. yielded 2 grs., equal to 1 dwt. 11 grs. per ton; 112 lbs. yielded nothing; 108 lbs. yielded 4 grs., equal to 3 dwts. 11 grs. per ton; 114 lbs. yielded 1 dwt. 8½ grs., equal to 1 oz. 6 dwts. 14 grs. per ton. Six other samples were reduced, but the results are not yet reported by Mr. Young

Mr. Webster: 100 lbs. of quartz yielded 1 dwt. 3 grs., equal to 1 oz. 5 dwts. 4 grs. per ton

Mr. Westlake: 112 lbs. yielded 1 dwt. 1 gr., equal to 1 oz. 20 grs. per ton

Mr. Balcombe, for Tamar Wheal Maria: 136 lbs. yielded 1 dwt. 14 grs., equal to 1 oz. 6 dwts. 1 gr. per ton; and 110 lbs. from Cae-Gynon, yielded 50 grs., equal to 2 ozs. 2 dwts. 10 grs. per ton

Mr. Robertson: 40 lbs. yielded nothing.

We understand 16 additional machines have been ordered during the present week.

From the *Mining Journal*, Dec. 31.

Subjoined is a list of the experiments made by Berdan's machine, during the present week, on the samples of gold-bearing gossan and mundic from the following mines:—

West Garm Mine: 112 lbs. ore produced 1 oz. 2 19-32 grs. gold, equal to 1 oz. 2 dwts. 4 grs. per ton

Ditto: 112 lbs. (No. 4), 2 dwts. 6 grs., equal to 2 ozs. 5 dwts, per ton

Ditto: 112 lbs. (No. 5), 3 dwts., equal to 3 ozs. per ton

Angarrrack: 108 lbs. of tin and silver, 2 dwts. 3 grs., equal to 2 ozs. 4 dwts. 1 gr. per ton

Henrietta and Blackenbury Consols: 36 lbs., 19½ grs., equal to 2 ozs. 12 dwts. 6 grs. per ton

Francisco: 136 lbs., 2 dwts., equal to 1 oz. 10 dwts. per ton

Rhenish Mining Company: 56 lbs., 1 dwt. 18 grs., equal to 3 ozs. 10 dwts. per ton

Ditto, Top of Concession: 96 lbs., 2 dwts. 3 grs., equal to 2 ozs. 9 dwts. 7 grs. per ton

Amelia: 34 lbs., 1 dwt. 1½ gr., equal to 3 ozs. 10 dwts. per ton

Virtuous Lady: 38 lbs. (No. 70), 2 dwts. 3 grs., equal to 6 ozs. 5 dwts. 6 grs. per ton

Ditto: 70 lbs. (No. 72), 12 grs., equal to 16 dwts. per ton

Franco (Devon): 174 lbs. refuse, 1 dwt. 21½ grs., equal to 1 oz. 4 dwts. 9 grs, per ton

Hingston Down Consols: 84 lbs. silver and gold, 4 dwts. 15½ grs., equal to 17 dwts. 5 grs. per ton

Devon Kapunda. 5 cwts. gossan, 5 dwts. 8 grs., equal to 1 oz. 1 dwt. 8 grs. por ton

Ditto: 5 cwts. of quartz, 6 dwts. 20 grs., equal to 1 oz. 7 dwts. 8 grs. per ton

Trenault (Cornwall), 10 lbs., 1 dwt. 11 grs., equal to 16 ozs. 6 dwts. 16 grs. per ton

Ditto: 33 lbs., 3 dwts. 3 grs., equal to 10 ozs. 12 dwts. 3 grs. per ton

Clew Bay Mining Company: 130 lbs., 2 dwts. 13 grs., equal to 2 ozs. 3 dwts. 19 grs. per ton

Crookhaven: 157 lbs. copper ore, 20 grs., equal to 11 dwts. 21 grs. per ton

By the above returns, it will be perceived that some Cornish ore gave an equivalent to 10 ozs. 12 dwts. 2 grs. per ton; and another parcel, from the same mine, at the rate of 1 lb. 4 ozs. 6 dwts. 16 grs. troy per ton. This is the greatest yield which has been obtained from English ore, where the precious metal was not visible.

From the *Mining Journal*, Jan. 7.

The following is a list of the experiments made by Mr. Berdan's machine, during the present week, on the samples of gold-bearing gossan and mundic:—

Five experiments, without any yield of gold

Ulverston: 800 lbs. iron ore, yielded 45 per cent. of iron.—(Result satisfactory; machine will be adopted for the reduction of similar ore.)

Three experiments, one yielding no gold; results of the others not declared

Three experiments on Irish ore, two yielding no gold; the other a trace only

Vigra: 224 lbs. quartz, produced 2 ozs. gold per ton

Ditto: 224 lbs. quartz, 2 dwts. per ton

Two samples of gossan, only a trace

One sample of mundic, nothing

Wheal Peru: 54 lbs. gossan, 12 grs., equal to 1 oz. 0 dwt. 17 grs. per ton.

Three samples, nothing

Craigwen: 190 lbs. quartz, 3 dwts. 1 gr., equal to 2 ozs. 0 dwt. 4 grs. per ton

Worthing (Australia): 40 lbs. quartz, 1 dwt. 10 grs., equal to 3 ozs. 19 dwts. 8 grs. per ton

Thirteen other experiments, results not announced

Mr. Fuller: 224 lbs., 1 dwt. 6 grs., equal to 12 dwts. 12 grs. per ton

Ditto: 224 lbs., 3 dwts. 12 grs., equal to 1 oz. 15 dwts. per ton

Ditto: 217 lbs., 1 dwt. 8 grs., equal to 13 dwts. 18 grs. per ton

Ditto: no particulars announced

Tremollet Downs: 112 lbs. mundic, 1 dwt. 18 grs., equal to 1 oz. 15 dwts. per ton

Worthing (Australia): 70 lbs. quartz, 1 dwt. 1 gr., equal 1 oz. 13 dwts. 8 grs. per ton

——: 107 lbs. gossan, nothing

——: 21 lbs. grey ore, nothing

* This ore was part of a large quantity (about 100 tons), sent over by Mr. Catherwood, about two years ago, as a fair sample of Gold Hill quartz. There was barely a trace of gold visible in any part of the original cargo; and the portion employed on this occasion was selected, as including the smaller specimens of 10 tons, purchased a year ago for the Crystal Palace Company. These had been broken by hand at Sydenham to about the size of a hen's egg.

Reynolds, V. I.: 20 lbs. (supposed tin), 1 dwt. 3 grs., equal to 6 ozs. 4 dwts. per ton
Ulpha United: 100 lbs , 5 grs., equal to 4 dwts. 16 grs. per ton
Coniston United: 136 lbs., 6 dwts. 6 grs., equal to 5 ozs. 3 dwts. per ton
Two experiments on unknown ore, nothing
Dinas Great Consols: 2½ cwts. sulphur, 4 dwts. 18 grs., equal to 1 oz. 18 dwts. per ton.—(This experiment corroborates the result of former tests.)
Mr. Goatley; results not communicated
Mr. Hodgkinson: results not communicated
Johnson and Matthey, two experiments: results not communicated
Mr. Cazenove: 112 lbs. silver lead, nothing
Devon: 112 lbs. gossan, nothing
Ditto: 223 lbs. gossan, a trace
Merioneth: 124 lbs. quartz, a trace
Great Treburget: 212 lbs. gossan, 1 dwt. 21 grs., equal to 19 dwts. 21 grs. per ton

From the *Mining Journal*, Jan. 14.

The following are the results of experiments by Mr. Berdan's machine during the week:—

Davidson and Peter, four experiments: gossan, flookan, and mundic, not communicated
Mr. Truscott, four experiments, produced nothing.
Ditto, Cubert Mine: 106 lbs. quartz produced 6 grs. gold, equal to 5 dwts. 6½ grs. per ton
J. S. Lane, Molland Mines, South Devon: 64 lbs. ore, 1 dwt. 2 grs., equal to 1 oz. 17 dwts. 22 grs. per ton
Mr. Nattle, Devon Buller Great Consols: 73 lbs. stuff, a trace
Ditto, Lezant Consols: 45 lbs. gossan, 11 grs., equal to 1 oz. 2 dwts. 19 grs. per ton
C. Lyall, Clew Bay Mining Co.: 112 lbs. mundic, not communicated
Ditto: 112 lbs. quartz, not communicated
Four other private experiments, results not communicated
Mr. Wescombe, Devon: 198 lbs. elvan, nothing
Ditto: 280 lbs. gossan, 3 dwts. 20 grs. silver and gold, the proportion unknown
Ditto: 181 lbs. gossan, 22 grs., equal to 11 dwts. 8 grs. per ton
Ditto: 183 lbs. quartz, 2½ grs., equal to 1 dwt. 7 grs. per ton
Ditto: 279 lbs. gossan, a trace
Ditto: 246 lbs. gossan, 14 grs., equal to 5 dwts. 7 grs. per ton
Mr. Batters, Penmaen Gol , Dolgelly: 106 lbs. gossan, 14 grs., equal to 12 dwts. 7 grs. per ton
Ditto: 289 lbs. quartz, unknown
Mr. Blacksley, Ballymurtagh, Wicklow: 72 lbs. gossan, 16 grs., equal to 1 oz. 0 dwt. 18 grs. per ton
Ditto: 154 lbs. mundic, 1 dwt. 5½ grs., equal to 17 dwts. 21 grs. per ton
Mr. Wescombe, Wheal Adams, Devon: 167 lbs. gossan, 12 grs., equal to 6 dwts. 17 grs. per ton
Ditto, Wheal Robins: 211 lbs. quartz, a trace
Ditto, Exmouth: 136 lbs. gossan, not communicated
Mr. Batters, Penmaen Gold Mine: 190 lbs. quartz, 3 dwts. 10 grs., equal to 2 ozs. 1 dwt. per ton
Ditto: South United Mines: 50 lbs. gossan, not ascertained
Mr. C. Clark, Creetown Mining Co.: 318 lbs. gossan, 5 dwts 9 grs. copper and gold
Mr. Eaton, Eaglebrock Mines: 217 lbs. lead ore, 1 dwt. 18 grs., equal to 18 dwts. per ton
Seven other private mines, result not communicated
Six ditto ditto
Mr. Manuel, Cornwall: 94 lbs. tin, 13 grs., equal to 12 dwts. 21 grs. per ton
Ditto: 160 lbs. quartz, nothing
Ditto: 275 lbs. gossan, 1 dwt. 19 grs., equal to 14 dwts. 14 grs. per ton
P. Pye, Hennock Mine: 172 lbs. gossan, 6 grs., equal to 3 dwts. 4 grs. per ton
Ditto: 170 lbs. gossan, not communicated
Ditto: 192 lbs. quartz, not communicated.
Two private mines, result not communicated
Mr. Burt, North Caradon Mine: 354 lbs. gossan, 5 grs., equal to 1 dwt. 8 grs. per ton
Mr. Bell, Devon Burra Burra: 152 lbs. capel, 31 dwts. 12 grs., not all gold, proportion not communicated
One private mine, result not communicated
Mr. Tripp, Quintrell Downs: 297 lbs. gossan, 1 dwt. 4 grs., equal to 8 dwts. 19 grs. per ton
Mr. Pye, Birch Aller: 224 lbs. gossan, 1 dwt. 5 grs., equal to 12 dwts. 2 grs. per ton
Ditto: 224 lbs. gossan, not communicated
Four private mines, result not communicated
Mr. Wescombe, Wheal Christopher: 224 lbs. gossan, a trace
Mr. Duthoit: 108 lbs. quartz, a trace.
Mr. Goodman, Vigra Mine: 224 lbs. quartz, 3 dwts. 12 grs., equal to 1 ozs. 5 dwts. per ton
Mr. Reid, Drewsteignton Mine: 9 lbs. iron pyrites, 2 grs., equal to 1 oz. 17 dwts. per ton
Ditto, ditto: 196 lbs. gossan, 4 dwts. 3½ grs., equal to 2 ozs. 7 dwts. 14 grs. per ton
Ditto, South Tawton: 17 lbs. gossan, 4 grs., equal to 1 oz. 2 dwts. per ton
Mr. Calvert, Calstock Consols: 258 lbs. gossan, 3 dwts. 13⅓ grs., equal to 1 oz. 10 dwts. 17 grs. per ton
Mr. Fuller: one experiment, nothing
Ditto: 168 lbs., 1 dwt. 6 grs., equal to 16 dwts. 16 grs. per ton
Ditto, Wheal Surprise: 112 lbs. gossan, 1 dwt., equal to 1 oz. per ton
Ditto: one experiment, nothing
Ditto: 120 lbs. gossan, 2 dwts. 4 grs., equal to 2 ozs. 0 dwts. 10 grs. per ton
Ditto, Devon United: 120 lbs. gossan, 1 dwt., equal to 18 dwts. 16 grs. per ton
Mr. Manuel: 100 lbs. ditto, 1 dwt., equal to 1 oz. 2 dwts. per ton
Mr. Eaton, New East Crowndale: 235 lbs. mundic, 2 dwts. 17 grs., equal to 1 oz. 5 dwts. 19 grs. per ton
Mr. Bartlett, Temple Consols: 70 lbs. spar and gossan, 1 dwt. 1 gr., equal to 1 oz. 13 dwts. 4 grs per ton
Mr. Smith, one experiment, result not communicated
Mr. Routledge, Leighcloon Mine: 250 lbs. gossan and elvan, 7 dwts. 6 grs., equal to 3 ozs. 4 dwts. 23 grs. per ton
Ditto: 183 lbs. quartz, 7 dwts. 9 grs., equal to 4 ozs. 10 dwts. 7 grs. per ton
Mr. Murchison, Okehampton Mine: 129 lbs. quartz, a trace
Mr. Goodman, Virga Mine: 140 lbs. gossan, 13 grs., equal to 8 dwts 12 grs. per ton.

From the *Mining Journal*, Jan. 21.

The following are the results of experiments by Mr. Berdan's machine during the week:—

Hon. Mr. Browne: 75 lbs. of gossan, result not communicated
Ditto: 172½ lbs. gossan, not communicated
Bwlchystallen Mine: 112 lbs. gossan, produced nothing
Mr. Catty: 89 lbs. gossan, produced 2 dwts. of gold, equal to 2 ozs. 10 dwts. per ton
Mr. Goodman, per B. Colman: 204 lbs. quartz, 2 dwts. 11 grs., equal to 1 oz. 7 dwts. per ton
Okel Tor Mine: 245 lbs. gossan, not communicated
Mr. Foley: 192 lbs. silver and lead, not communicated
Keswick Mine: 336 lbs. gossan, 9 grs, equal to 2 dwts. 12 grs. per ton.
Ditto: 224 lbs. quartz, nothing
Capt. Jenner: 53 lbs. quartz, not communicated
Penstruthal Mine: 168 lbs. gossan, 21 grs., equal to 11 dwts. 16 grs. per ton
Devon and Courtenay Mine: 112 lbs. gossan, nothing
Harriet Sophia Mine: 78 lbs. gossan, 23 grs., 1 oz. 7 dwts. 13 grs. per ton
Tamar Maria Mine, 228 lbs. gossan, 2 dwts. 1 gr., equal to 1 oz. 0 dwt. 1 grain per ton
Penllyne Court Mine: 65 lbs. gossan, 18 grs., equal to 1 oz. 5 dwts 10 grs. per ton
Caegwian Mine, Dolgelly: 90 lbs. quartz, 27 grs., equal to 1 oz. 8 dwts. per ton
Clowance Wood Mine: 165 lbs. quartz, 14 grs., equal to 8 dwts. per ton
Calstock United: 103 lbs. quartz, 3 grs., equal to 2 dwts. 17 grs. per ton
South: 22 lbs. gossan, not communicated
Merionethshire Mine: 112 lbs. quartz, 7 grs., equal to 6 dwts. per ton
Treleigh Mine: 176 lbs. gossan, 3 dwts. 4 grs., equal to 2 ozs. 5 dwts. 14 grs. per ton
North Devon: 168 lbs. gossan, nothing
Mr. Reynolds: 34 lbs. quartz, not communicated
Mr. Nye: 54 lbs. gossan, not communicated
Mr. Readwin: 16 lbs. gossan, a trace
Mr. Brunton: 200 lbs. mundic, not communicated
Ditto, 200 lbs. gossan, a trace
Mr. King: two experiments, not communicated
St. Jago Gold Nugget Company: 23 lbs. felspar, 6 grs., equal to 1 oz. 4 dwts. 8 grs. per ton
Ditto: 29 lbs. felspar, 5 grs., equal to 16 dwts. 2 grs. per ton
Ditto: 16 lbs. felspar, nothing
Ditto: 24 lbs. felspar, 4 dwts. 10 grs., equal to 20 ozs. 12 dwts. 5⅓ grs. per ton
Wheal Fortune: 53 lbs. gossan, nothing
Mr. Valentine: 112 lbs. gossan, not communicated
Carnarvon: 160 lbs. gossan, 30 grs., equal to 17 dwts. 6 grs. per ton
Penllyne Court: 210 lbs. gossan, 40½ grs., equal to 18 dwts. per ton
Blaen Caylen: 150 lbs. gossan and copper pyrites, 20 grs., equal to 13 dwts. per ton
Bronfloyd: 107 lbs. quartz, nothing
Crookhaven Mines: 255 lbs. gossan and quartz, 3 dwts. 8 grs., equal to 1 oz. 9 dwts. 6 grs. per ton
Ditto: 263 lbs. mundic, a trace
Duke of Cornwall Mine: 146 lbs. mundic, nothing
Twelve experiments, by Professor Ansted, for Irish Consols, results not yet declared
Trenault Mining Company: 70 lbs. quartz, 2½ dwts., equal to 4 ozs. per ton
Poltimore Company: 470 lbs. gossan, 3 dwts. 19 grs., equal to 18 dwts. 1 gr. per ton
Three experiments, Mr. Readwin: not communicated
One experiment, Mr. Coleman: not communicated
Carrock Mine: 280 lbs. gossan, not communicated
Prince of Wales Mine: 33 lbs. gossan, 64 dwts., equal to 217 ozs. 4 dwts. 6 grs. per ton
Lamerton United: three experiments, not communicated

From the *Mining Journal*, Jan. 28.

The following are the results of experiments made by Berdan's machine during the week:—

Coosheen Mine: 171 lbs. quartz, produced a trace of gold
Ditto: 148 lbs. gossan, 10 grs., equal to 6 dwts. 3 grs. per ton
Mr. Foley: one experiment, copper ore, produced nothing
Mr. Smith: 61 lbs. gossan, not communicated
Ditto: 154 lbs. gossan, ditto
Ditto: 224 lbs. gossan, ditto
Ditto: 325 lbs. gossan, ditto
Mr. White, Ireland: 40 lbs. quartz, 23 grs., equal to 2 ozs. 13 dwts. 16 grs. per ton
Ditto: 103 lbs. quartz and gossan, nothing
East Wheal ——: 30 lbs. gossan, not communicated
Ditto: 19 lbs., gossan, nothing
Cubert United Mines: 224 lbs. mundic, 2 dwts. 5 grs., equal to 1 oz. 2 dwts. 2 grs. per ton
Ditto: 224 lbs. quartz, 1 dwt. 16 grs., equal to 1 oz. 13 dwts. 8 grs. per ton
Ditto: 224 lbs. gossan, 7 dwts. 6 grs., equal to 3 ozs. 12 dwts. 12 grs. per ton
Mr. Simons: 19 lbs. gossan and quartz, 10 grs., equal to 8 dwts. per ton.
Mr. Hallow: 122 lbs. spar, not communicated
Arthur Mine: 236 lbs. mundic, nothing
Ditto: 243 lbs. gossan, 2 dwts. 21 grs., equal to 1 oz. 6 dwts. 6 grs. per ton
A Mine in Devonshire: 143 lbs. gossan, 3 dwts. 20 grs., equal to 3 ozs. 0 dwts. 1 gr. per ton
Latchley Consols, Cornwall: 64 lbs. quartz, 1 dwt. 8 grs., equal to 2 ozs. 6 dwts. 8 grs. per ton
Ditto: 92 lbs. gossan, 4 grs., equal to 3 dwts. 9 grs. per ton
South Poltimore Company: 524 lbs. gossan, 7 dwts. 12 grs., equal to 1 oz. 16 dwts. 8 grs. per ton
Mr. Smith: 42 lbs. gossan, 1 dwt. 7 grs., equal to 3 ozs. 8 dwts. 21 grs. per ton
Latchley Consols: 112 lbs. quartz, nothing
Halloon Mine: 36 lbs. gossan, 4 dwts. 13 grs., equal to 14 ozs. 2 dwts. 14 grs. per ton
Pencorse Mine: 45 lbs. mundic, a trace
Mr. Manuel: 88 lbs. silver and mundic, nothing
Ditto: 116 lbs. tin ore, 5 grs., equal to 4 dwts. per ton
Okehampton Mines: 130 lbs. gossan
Mr. Vigers: 30 lbs. quartz, nothing
Mr. Charles: 112 lbs. sulphur, not communicated
Ditto: 140 lbs. gossan, 1 dwt., equal to 16 dwts. per ton
Ditto: 174 lbs. ditto, 5 grs., equal to 2 dwts. 16½ grs. per ton
Ditto: 172 lbs. ditto, 3 grs., equal to 1 dwt. 9½ grs. per ton
Ditto: 165 lbs. ditto, nothing
Mr. Lyle: one experiment, produced nothing
Ditto: 70 lbs. gossan, a small quantity of gold, the amount not communicated
Ditto: 99 lbs. mundic, ditto
Ditto: one experiment, ditto
Ditto: 82 lbs. mundic, ditto
Ditto: 93 lbs. gossan, ditto
Ditto: one experiment, arsenic
Ditto: ditto, nothing
South Totten: 187 lbs. gossan, not communicated
Ditto: 113 lbs. gossan, 1 dwt. 21 grs., equal to 1 oz. 17 dwts. 4 grs. per ton
Ditto: 60 lbs. gossan, 2 dwts. 2 grs., equal to 3 ozs. 17 dwts. 9 grs. per ton
Ditto: 61 lbs. gossan, a trace
Mr. Readwin: 112 lbs. quartz, 22 grs., equal to 18 dwts. 4 grs. per ton.
Trawvfyngdd: 100
A mine in Belgium: 112 lbs. mundic, copper and gold, not commmunicated
Mr. Routledge: 112 lbs. gossan, 1 dwt. 7 grs., equal to 1 oz. 5 dwts. 20 grs. per ton
Ditto: 100 lbs. gossan, 19 grs , equal to 17 dwts. 17 grs. per ton
Mr. Gwatkin: 100 lbs. mundic, nothing
Ditto: 100 lbs. mundic, ditto
Mr. Braine: 87 lbs. quartz, 2 dwts., equal to 2 ozs. 11 dwts. 12 grs. per ton.

[An error occurred in the list of last week's trials by Mr. Berdan's machine, with respect to the Poltimore gossan. Instead of 18 dwts. 1 gr., it should have been 1 oz. 3 dwts. 19 grs., the actual yield of gold from 470 lbs. of gossan having been 5 dwts.]

From the *Mining Journal*, Feb. 4.

The following are the results of the various experiments made during the week by Berdan's gold machine:—

Messrs. Crease, per Johnson and Matthey: 326 lbs. mundic, produced nothing
Ditto: 183 lbs. mundic, nothing
Ditto: 56 lbs. clay, result not communicated
Carn Valley Mine: 54 lbs. mundic, 15 dwts. 15 grs. silver and gold
Cumberland and Lancashire: 63 lbs. gossan, result not communicated
Ditto: 85 lbs. gossan, result not communicated
Newydda: 88 lbs. mundic, equal to 18 dwts. per ton
Mr. Hacket: 112 lbs. gossan, 9 grs., equal to 7 dwts. 12 grs. per ton
Mr. Routledge: —— quartz, nothing
Mr. Reynolds: 179 lbs. quartz, 16 grs., equal to 8 dwts. 8 grs. per ton
Wheal Hamlin: 74 lbs. gossan, nothing
Ditto: 82 lbs. gossan, 3 dwts. 18 grs. gold, silver, and copper
Kenmare Mine: 223 lbs. gossan, 6 grs. gold and copper
Ditto: 112 lbs. gossan, 14 grs. gold, copper, and silver
Sir Charles Kirkpatrick: 56 lbs. gossan, 5 grs., equal to 8 dwts. 8 grs. per ton
Ditto: 77 lbs. white iron, 5½ grs., equal to 6 dwts. 16 grs. per ton
Devon Consols North: 112 lbs. gossan, 15 grs., equal to 12 dwts. 12 grs. per ton
Ditto: 112 lbs. mundic, nothing
Trelawny Mine: 224 lbs. gossan, not communicated
Carbery West; 266 lbs. quartz, a trace
Pengwern Mine: 86 lbs. gossan, 1 dwt., equal to 1 oz. 6 dwts. 1 gr. per ton
Mr. Biggs: 72 lbs. gossan, nothing
Mr. Fuller: 188 lbs. gossan, not communicated
Wheal Zion: 112 lbs. gossan, not communicated
Mr. H., North Cornwall: 112 lbs. quartz, 10 grs., equal to 8 dwts. 8 grs. per ton
Ditto: 60 lbs. quartz, a trace
Ditto: 20 lbs. quartz, a trace
Ditto: 60 lbs. quartz, 10 grs., equal to 15 dwts. 13 grs. per ton
Mr. Bartlett: 364 lbs. quartz, 1 dwt. 3 grs., equal to 7 dwts. per ton
Peruvian: 119 lbs. gossan, nothing
Perran Silver-Lead Mine: 160 lbs. gossan, 23 grs., equal to 13 dwts. 4 grs. per ton
Charlestown Mine: 232 lbs. gossan, 2 dwts. 23 grs., equal to 1 oz. 8 dwts. 13 grs. per ton
Wheal Kitty, St. Agnes: 150 lbs. mundic, 16 grs., equal to 9 dwts. 23 grs. per ton
Ditto: 150 lbs. gossan, 4 grs., equal to 2 dwts. 12 grs. per ton
Prince Albert Consols: 188 lbs. gossan, 3 dwts., equal to 1 oz. 15 dwts. 18 grs. per ton
Perran Wheal Jane: 208 lbs. gossan, a trace
Devon and Cornwall United: 224 lbs. gossan, 4 dwts. 10 grs., equal to 2 ozs. 4 dwts. 4 grs. per ton
South Crenver: 160 lbs. gossan, a trace
Ditto: 200 lbs. gossan, 3 dwts. 22 grs., equal to 2 ozs. 3 dwts. 20 grs. per ton.
Clowance Wood: 170 lbs. gossan, 1 dwt. 12 grs., equal to 19 dwts. 9 grs. per ton
Ditto: 160 lbs. gossan, 9 grs., equal to 5 dwts. 3 grs. per ton
Calstock United: 115lbs gossan, 10 grs., equal to 8 dwts. 3 grs. per ton
Ditto: 115 lbs. gossan, 1 dwt. 12 grs., equal to 1 oz. 9 dwts. 5 grs. per ton
Calstock Mine: 116 lbs. mundic, a trace
Ditto: 110 lbs. gossan, 1 dwt. 7 grs., equal to 1 oz. 6 dwts. 7 grs. per ton
Ditto: 118 lbs. quartz, a trace
Maen Mine: 120 lbs. quartz and blende, 1 dwt. 12 grs., equal to 1 oz. 8 dwts. per ton
Britannia Mine: 220 lbs. gossan, 2 dwts. 10 grs., equal to 1 oz. 4 dwts. 4 grs. per ton
Wheal Trannack: 100 lbs. quartz, 23 grs., equal to 1 oz. 1 dwt. 11 grs. per ton
Trevenon Mine: 100 lbs mundic, 1 dwt. 6 grs., equal to 1 oz. 13 dwts. 8 grs. per ton
Mr. Battye: 150 lbs. mundic, 16 grs., equal to 9 dwts. 23 grs. per ton
Ditto: 150 lbs. mundic, 4 grs., equal to 2 dwts. 11 grs. per ton
Ditto: 188 lbs. mundic, 3 dwts., equal to 1 oz. 15 dwts. 18 grs. per ton

From the *Mining Journal* of this day.

This return embraces but four days' experiments—as arrangements are making for a series of trials on a large scale.

Mr. Arthur Dean: 219 lbs. quartz, produced 3 dwts. 20 grs. gold, equal to 1 oz. 19 dwts. 4 grs. per ton
Ditto: 175 lbs. quartz, 16 grs., equal to 8 dwts. 17 grs. per ton
Mr. Battye: 112 lbs. quartz, 14 grs., equal to 11 dwts. 16 grs. per ton
Ditto: 140 lbs. quartz, 19 grs., equal to 12 dwts. 16 grs. per ton
Wheal Franco Mine: 224 lbs. refuse, 3 dwts. 9 grs., equal to 1 oz. 13 dwts. 18 grs. per ton
Pwll Roman: 224 lbs. spar, 1 dwt. 1-10th gr., equal to 10 dwts. 1 gr. per ton
Mr. Fuller: 142 lbs. — not communicated
Ditto: 64 lbs. lead or flookan, 11 dwts. gold, silver, and copper per ton
Ditto: 87 lbs. — 8 dwts. 11 grs., gold, silver, and copper per ton
Mr. Ridge, Cornwall: 144 lbs. white iron and gossan
Mr. Fuller: 102 lbs. quartz, a trace
Wh. Alfred: 94 lbs. gossan, 1 dwt., equal to 1 oz. 3 dwts. 19 grs. per ton
Mr. Fuller: 188 lbs. gossan, not communicated
Mr. Readwin: 148 lbs. pyrites, 10 dwts. per ton
Ditto: 240 lbs. sulphur, 15 dwts. 12 grs. per ton
Ditto: 176 lbs. sulphur, 12 dwts. 4 grs. per ton
Mr. Hacket, Germany: 200 lbs. gossan, 1 dwt. 6 grs., equal to 14 dwts. per ton
Mr. Lloyd: 336 lbs. quartz, not communicated
Ivy Tor Consols: 71 lbs. gossan, 1 dwt. 2 grs., equal to 1 oz. 14 dwts. 4 grs. per ton
Mr. Torkington: 1 3 lbs. gossan, nothing
Llawrewmbach: 336 lbs. lead ore, 1 dwt. 15 grs., equal to 1 oz. 20 dwts. per ton
Pencraigdu: 336 lbs. lead ore, 4 grs., equal to 1 dwt. 3 grs. per ton
Trenault: 28 lbs. quartz, 1 dwt. 13 grs., equal to 6 ozs. 3 dwts. 8 grs. per ton
South Devon Great Consols: 68 lbs. gossan, 2 dwts. 14 grs., equal to 4 ozs. 5 dwts. 5 grs. per ton
Ditto: 70 lbs. gossan, 20 grs., equal to 1 oz. 6 dwts. 16 grs. per ton
Ditto: 120 lbs. gossan, 3 dwts. 12 grs., equal to 3 ozs. 5 dwts. 8 grs. per ton

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The long list of experiments, or, as we should perhaps rather call them, assays, above recited, ought, it would seem, to establish the fact that there is gold in the mines of this country in quantities sufficient to justify their being economically worked for that metal. No other conclusion is compatible with the integrity of these assays, and of their integrity there is no proper reason to doubt. It would evidently be the most short-sighted folly in Mr. Berdan to peril the permanence of his success by giving improper returns; while the public character of the trials, the uniformity of results, in whatever hands the machine has been placed, and the improbability of so large a number of unconnected individuals joining in an attempt to mislead the public, all go to sustain the reliability of the results as a whole. In this opinion we are not alone, and do but echo the general voice of the press and of the public. Even the cautious writer of the city articles of the *Times* ventures, in terms, studied and reserved it is true, yet sufficiently significant, to indicate the great commercial importance of the results, and a belief in the genuine character of the experiments. We give an extract from the City Article of that paper of the 30th of January:—

"In the *Times* of the 2d of December an account was given of Berdan's gold crushing and amalgamating machine, which, after having been originally exhibited at the New York Crystal Palace, had been introduced into this country, and was said to have succeeded in extracting from many ores existing in abundance in Wales, Devonshire, and other parts of the kingdom, gold sufficient to yield an extraordinary profit. Since that time mining adventurers of all descriptions have thronged the works in the City-road, where the machine is set up, bringing with them samples of ores to be tested. The same plan has been adopted in some cases by the proprietors of foreign mines, and the total number of experiments performed is now 674, which are said to have resulted in orders being given for 76 machines. Out of these experiments, a large majority of which were upon materials presenting no visible trace of gold, 540 are alleged to have yielded that metal, and in two cases out of three in quantities that would pay for working. Indeed, the most common rate seems to be about 2 ozs. of gold to the ton; and, as the expense of working is only a few shillings per ton, the prospects are dazzling. These, however, are moderate results, compared with some that are obtained in special instances; and, although 16 or 17 ozs. per ton recently constituted the maximum, the wonders of a lead mine in North Wales have this week been proclaimed, the ore of which has given 217 ozs. of gold per ton from picked specimens, and something very extraordinary even from the inferior ones. The consequence of all this is a multitude of daily advertisements of mines that were never before heard of, giving "the results of experiments made with Mr. Berdan's machine," and there is every prospect that the rage will go on increasing. The depressed state of the money market prevents the movement being turned to such account as would otherwise be the case, but still from individual to individual its fame is quietly spreading, and there is reason to fear that many inexperienced persons may be duped. Against the efficiency of the machine itself no evidence has yet been publicly brought in any quarter. On the contrary, all that has thus far transpired seems to warrant a hope that its claims are sound, and that it may prove an important agent in accelerating the changes the gold discoveries are to bring about. There is also no reason, after the years in which gold was neglected in California and Australia, to assume that its abundant existence at home is either impossible or improbable. The temptations,

however, to false representations on the matter are such that no evidence short of long-continued demonstration should be acted upon with regard to it. Any question respecting the good faith with which the management of the machine is conducted by Mr. Berdan would, apparently, be unjustifiable, because he offers its uncontrolled use to all who wish to test its powers, without stipulating that any of his own people shall take part in the experiments to be tried; but it must be borne in mind that he knows nothing of the origin of the ores brought to him. A hundredweight of stuff from Australia or California could be divided among a set of schemers who might found upon it a reputation for half-a-dozen mines, and when it is known that, according to a recent statement by Mr. Hargreaves, at Sydney, a person who has since arrived here openly remarked, on purchasing a small quantity of auriferous earth, that he intended to make his fortune with it in England, there can be no degree of suspicion that is not warranted. At the same time the presumption that some of the reported results lately obtained are perfectly genuine is very strong. Even this, however, instead of causing the public to grasp eagerly at shares, should render them cautious, if not indifferent. Those who possess ore in abundance, yielding 2 ozs. of gold per ton, under a machine which costs only 600*l.*, and which can crush many tons a-day at an almost nominal expense, can scarcely, if they believe their own stories, desire to sell their shares to persons less informed of their value. In the first place, they cannot want money; and, in the next, the transaction would be as if a man cognisant of the worth of a sovereign were to sell it to a purchaser who, from his ignorance on that point, would only give 15s. for it. Again, if the successful experiments have been as numerous as is related, it is evident that the public need not hurry to get shares in the mines thus far discovered, since hundreds of others will constantly be added to the list, and the question will come to be, not only where is the district in which gold is not to be found, but what is to be its value when we have obtained it?"

On the question of gold in England, we find in *Chambers's Journal* an article headed with an affirmative settlement of it, from which we make the following extracts:—

"Now the sum and substance of the gold in England excitement is simply this: that by an improved mode of crushing and amalgamating, English ores may probably be worth working, which by any former process would yield too little gold to pay the expense. It appears that a gentleman, well acquainted with the gold-geology of Australia, has written a volume on the subject of gold in Britain just about the time when Mr. Berdan, an engineer, of New York, has invented a new ore-crushing machine.

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"This brings us at once to the subject of the ore-crushing machines—the means of liberating what little gold there may be in a mass of rock. It is impossible to glance over the advertising columns of the *Mining Journal*, and similar works, without seeing that these machines are now busy agents in the matter. One inventor points out the excellence of his stampers; another, of his cylindrical rollers, another, of his conical rollers, and so forth—each one claiming, of course, to be better than all the others. We are placed under no sort of necessity for expressing an opinion concerning the relative merits of the various machines: it will suffice to notice briefly what is now being done, or tried or planned, especially in relation to one particular machine, towards which the Devon and Cornwall mining companies are just at present looking with very eager eyes.

"It appears that Mr. Berdan, connected with a large engineering firm at New York, had his attention directed to the subject of the quartz in California; the quantity of which is immense, but the profitable working of which depends upon the invention of some more efficient apparatus than any hitherto in use. He sent engineers to California to examine the actual working of the existing machines, and the qualities requisite for efficient working. The result of his enquiries was the invention of a new machine, in which the mechanical and the chemical processes can be going forward at one time. Berdan's Gold-ore Pulveriser, Washer, and Amalgamator, was patented in 1852, and was first seen in London in October, 1853. It was set up in an engineering establishment in the City-road, and has gone through a continuous series of trials down to the period when this paper is being written. These trials have been instituted in part by such of the Californian and Australian gold companies as have offices and officers in London; but still more extensively by the Devon and Cornwall and Welsh companies, having copper, or tin, or lead mines. The objects in view in all these trials are two—to assertain how much gold exists in a ton of ore, and to determine the expense at which the extraction can be effected.

"The machine itself, be its efficacy what it may, is certainly remarkable. A huge rotating basin, with two huge balls rolling about in it, quicksilver within it, water trinkling into it, and fire beneath it—altogether a strange combination of the mechanical and the chemical. The machine is intended, as we have said, to perform at one operation the pulverising, and washing, and amalgamating of such ores as contain a little gold, with especial regard to the recovery and retention of every atom of the precious metal so contained. The basin, which forms the primary part of the apparatus, is made of iron, very strong, and about 7 feet in diameter. It rotates on an axis; but this axis, instead of being vertical, as might be expected, is inclined. In this basin are two monster cast-iron balls, such balls as would take an artilleryman's breath away: the smaller measures about 24 inches in diameter, and weighs about 20 cwts.; the larger is 34 inches in diameter, and weighs 50 cwts. Under the basin, and attached to and revolving with it, is a conically formed furnace. When operations are about to commence, fire is kindled in the furnace beneath the basin, quicksilver is poured into the basin, the ore is thrown in in lumps, and the basin is made to revolve. Hand or horse, or water or steam power would suffice, so far as the principle is concerned; the details would be determined according to the circumstances of each case. Now the movement of the balls, owing to their difference in size, and to the obliquity of the axis of the basin, becomes very peculiar; they appear to be making a perpetual but ineffectual attempt to ascend the curved incline, and to roll down again by their own gravity; they combine a sort of spiral with a rotating motion, and the combination is found to be peculiarly effective in crushing the ore which is in the basin. The smaller ball does not so much crush the ore, as affect the peculiar movements of the larger. The actual crushing is effected at the point of contact between the larger ball and the basin; and at this particular point the ore is immersed in quicksilver. Directly, therefore, the little gold particles become isolated from the earthy particles, by a crushing which reduces the whole to a fine powder, the quicksilver seizes upon the gold, and forms with it an amalgam or chemical compound, which remains in a state of proud exclusiveness from the baser substances. This is aided by two other elements in the apparatus: the furnace, by heating the quicksilver, renders its affinity for gold greater; while a streamlet of water, which falls into the basin from above, forms a thin paste or mud with the refuse powder which rises to the top of the quicksilver, and flows off through openings just below the rim of the basin. This paste is called, in the technical language of the metallurgists, tailings; and it is spoken of as a great point in Berdan's machine, that the tailings contain scarcely an atom of gold. In some cases, where ore has been prepared by the clumsier machines of earlier invention, the tailings have yielded as much gold by Berdan's process as had been before obtained from the ore. Some of the machines have two, and some even four basins, with a due quota of furnace and balls. The four-basin machines are of immense size, and give one a striking idea of the powre of the apparatus, accompanied as it is by a kind of roaring sound due to the movements of the ponderous balls. The prices of the complete apparatus are, 650*l.*, 1250*l.*, and 2400*l.*, according as it comprises one, two, or four basins—prices which sufficiently show how large and important the machine must be. It is estimated that a machine with four basins will treat forty tons of ore per day, with fifteen-horse moving-power.

"Professor Ansted wrote to the *Times* in December, 1853, to detail the results which he had obtained in a series of experiments on the Berdan machine, the apparatus having been placed at his disposal by Mr. Berdan for that purpose. There were two series of operations; the crushing and amalgamating of certain Californian and English ores, supposed to be auriferous, conducted by Professor Ansted himself; and the ultimate analysis of the waste from each sample, conducted by Mr. Henry, a distinguished metallurgic chemist. It would be out of place to detail all the experiments here; but a few notices may be interesting. About a year ago, 100 tons of quartz were sent over to England from California, belonging to the Agua Fria Mining Company; there was barely a trace of visible gold in it, but the company wished to determine whether it was really worth working or not: 10 tons of which were purchased by the Crystal Palace Company, for deposition at Sydenham; and from this portion Professor Ansted obtained half a ton for purposes of experiment.

"The feeding of the machine with this quantity occupied about an hour and a quarter. When the quartz had passed into the basins, the latter were rotated at the rate of about 20 revolutions in a minute, and 10 gallons of water were introduced into each basin in a minute. The ore or quartz was previously ground to a very fine powder. The result of the analysis was, that there were 4 ozs. 4 dwts. 21 grs. of fine gold, worth 17*l.* 18s. 3d., in a ton of the quartz; and from a subsequent analysis of the waste or tailings, it was found that so little gold was contained therein, that 95·8 per cent. of all the precious metal had been preserved by the action of the machine. In another experiment, Professor Ansted selected some of the gossan which occurs in the copper lodes of some of the Devonshire mines, and which presented nothing like an auriferous appearance; nevertheless, the analysis brought out 1 oz. 12½ dwts. of gold to the ton of gossan, nearly, but not absolutely, pure. The waste contained about 7 per cent. of the gold. In comparing the relative advantages of this and of other methods of crushing and amalgamating, Professor Ansted awards the superiority to Mr. Berdan's in these three particulars: that it separates and preserves a much larger per centage of whatever gold may happen to be contained in the ore; that it requires no skilled labour to work it; and that it affords easy means of preventing the peculation which is apt to occur when the working of other apparatus gets into the hands of dishonest persons. He states, finally, that when ore contains even only ½ oz. of gold to the ton, Berdan's apparatus will work advantageously."

In connection with this subject, we may refer to some editorial remarks in another column, and now conclude our notice with a short sketch of the history of Mr. Berdan's invention, and of the construction and operation of the machine. We understand that it has now become the property of English capitalists, and is about to be brought out as a company, under the most respectable auspices.

The machine, as it now appears, is a very great improvement on the first one made by Mr. Berdan. The first machine was exhibited at work in December, 1852. It had but one ball, which weighed only 1700 lbs., and was attached by a universal joint to the central shaft. About 20 of these machines were made and sold; but although they were more efficient than machines before used, especially when employed upon refuse, or "tailings," which had already been partially pulverised, they were regarded by the inventor as entirely too small, and far from perfect. A few of them were set up in California and North Carolina, and obtained from "tailings," supposed to be practically exhausted, 19 per cent. of the original riches of the ores. Only eight of these small machines still remain in use, all the others having been exchanged by Mr. Berdan for large and improved machines, similar to those now at work in England. The first improvement made on the small machines was increasing the ball to three times its original weight. It was still, however, left attached to the centre shaft. An immense increase of efficiency was the immediate result of this modification The small ball which had been rejected was, on one occasion, and merely as a matter of curiosity, placed in the basin alongside the large one, when it was found to steady the motion, and increase the rapidity of the reduction. Finally, it was determined to disconnect the large ball from the shaft, and run both balls loose. This was tried, and the result was perfectly satisfactory, and left the large machine in its present condition.

It consists mainly of a cast-iron basin, 7 feet in diameter, revolving upon an inclined axis or shaft. In this basin are placed two cast-iron balls, the larger one 34 in. in diameter, and weighing 2½ tons; the smaller one 24 in. in diameter, and weighing 1 ton. Under the basin, and attached to, and revolving with it, is a furnace of conical form. The whole is hung in a strong framework of timber, and receives motion from hand, horse, or steam power, by means of simple cog-gearing.

The operation is as follows:—Fire is made in the furnace, beneath the basin; quicksilver is placed in the basin, and the auriferous ore is thrown in, in lumps of considerable size. The apparatus is then set in motion; the balls, by their gravity, revolving in a direction opposite to that of the basin. The two balls, moving in contact with each other, and with the inclined bottom of the basin, receive a spiral as well as a rotary motion—a combination which is found to possess the greatest efficiency in the pulverisation of the ore. The ore is brought under the balls, and instantly crushed to an impalpable powder. The crushing is effected, of course, at the point of contact between the large ball and basin, and below the surface of the mercury. Thus, the moment the gold is disengaged, it comes in contact with pure and heated mercury, which seizes upon and secures it. The refuse powder rises to the surface of the quicksilver, whence it is carried off, in the form of a thin paste, by a small stream of water, which runs in at the upper side of the basin, and escapes through suitable openings, just below its rim, into a trough placed for the purpose: the tailings, or refuse, may thus be preserved for analysis, if desired.

The novel features of the machine are both mechanical and chemical. The arrangement of an inclined revolving basin, in connection with balls of corresponding size and weight, produces a rolling and grinding motion, which it is believed has never heretofore been attained. The inclination of the basin is, perhaps, the main point of the invention. By it three of the five principles before alluded to are brought into use. The mercury and balls are kept always at the crushing point; and thus the amalgamation is insured at the *instant*, and at the *point* of crushing, below the surface of the mercury. The heating of the mercury is also facilitated by this arrangement; for it is obvious that if the bottom of the basin were horizontal, and fire were applied below, the heat would pass through the iron and the mercury to the water above, leaving both metals comparatively cold; but by the inclination of the basin the bottom is exposed, for more than half of each revolution, to the direct action of the fire, without having water above to carry off the heat; thus when it passes at a high temperature under the mercury it effectually communicates heat to that metal, and places it in the best condition for seizing upon the gold as fast as it is liberated. The chemical novelty consists in the heating of the mercury, which has never been attempted on a large working scale before.

It is to be observed that this machine is not simply a crusher, but that it does *all the work* necessary to secure the desired product in combination with mercury. It crushes, washes, and amalgamates at one and the same operation. The simplicity of its parts, the almost entire avoidance of friction in its gearing, and the trifling power required to work it, render it an important addition to mining machinery, and worthy of being subjected to every test that practical and scientific men can devise. It is found that a machine consisting of four basins in one frame, will pulverise, wash, and amalgamate about 20 tons of ore, of average hardness, in 10 hours, with 15-horse power. Any number of basins can be used in one frame and driven by one main shaft.

The peculiarities of this invention do not consist in the use of balls and basins; but, 1. The inclining of the shaft on which the basin revolves, which keeps the mercury always at the crushing point, and causes the balls to work by gravity.—2. The production of a combined rolling and grinding action by the contact of the balls.—And 3. The addition of heat to the mercury by means of the furnace below the basin. No machine which does not combine these three peculiarities can be considered as having a resemblance to Berdan's. The machine—

1. Grinds the ore to an impalpable power.
2. It amalgamates at the instant of crushing.
3. It amalgamates below the surface of the mercury.
4. It heats the mercury used in amalgamating.
5. It has attached to it an auxilliary machine, which entirely prevents loss of mercury.

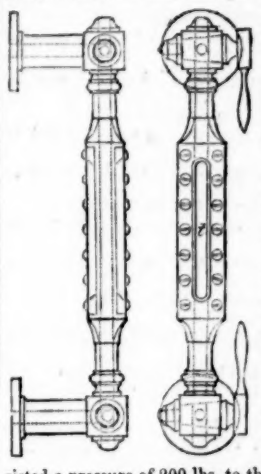
This auxilliary machine is called a separator, and is as simple in its construction as the principal machine.

A tub of cast-iron is constructed, 24 inches in diameter, and 20 inches high. In the centre of this tub is placed an upright tube, 3 inches in diameter, having at its lower end horizontal hollow arms attached at right angles to the tube. These arms have at their ends and on one side narrow slots, or elongated openings. Around the upright tube is placed a sleeve, which revolves upon it; to this sleeve are attached vertically adjustable wings or slots; the sleeve with its wings is revolved in an opposite direction to the tube and its arms, by means of a bevel driving-wheel attached to the main shaft, and working into wheels of similar bevel, attached at a proper distance apart, one to the sleeve and the other to the tube.

The mode of the operation of the machine is as follows:—A quantity of mercury, several inches deep, is placed in the bottom of the tub; the wings of the sleeve are then so adjusted that they will just clear the surface of the mercury when the machine is in motion. The driving-shaft being put in motion, the tube and arms revolve, as before stated, in a direction opposite to that of the sleeve and wings. The pulverised ore or refuse from an amalgamating machine in suspension in water is fed in through the tube, and passes into the arms at its bottom, whence it is driven by centrifugal force through the narrow slot-shaped openings at the end and back part of the arms, and passes forcibly out in a thin sheet underneath the mass of mercury in the bottom of the tub; this mercury by affinity retains all the floured mercury which may have been broken up in the process of amalgamating, and seizes upon all particles of gold which may have escaped the previous operation, while the pulverised matter suspended in water, rises to the top of the mercury, and being kept in suspension by the operation of the wings, is driven to the top of the tub and passes off through an exit spout, provided for the purpose. This machine need not be confined to the separation and saving of floured mercury from the refuse of other machines, but it may also be used as an independent amalgamator.

TALC WATER GAUGE FOR STEAM-BOILERS.

Mr. James Goodfellow (who is connected with Her Majesty's Dockyard, Devonport), having proved by experiment that thin plates of talc were capable of sustaining enormous pressure, and the material not being liable to fracture from changes of temperature, like glass, he has introduced it in the construction of gauges on steam-boilers. The talc, *t*, is secured to an oblong box by the perforated plate by means of several screws, and the box forms two windows, through which the rise and fall of the boiler-water level may be easily seen. Two of these gauges were sent to the Exhibition. The one here delineated represents the instrument as arranged by Mr. J. Anthony, of the Devonport Foundry, who has lately introduced them into mining boilers, and proved by them that the gauge cock indicates a level of the feed of from 1 in. to 1¾ in. higher than the real height of the water, thus allowing of the chance of accident by explosion. The two cocks possess all the properties of the three cocks and stuffing-boxes of the old water gauges. One of these gauges has been employed in Her Majesty's Dockyard, Devonport, for the last two years, under a steam pressure of 50 lbs. Under the water-pressure test, a gauge having an aperture 6 inches long and ¾ inch wide with talc 1-48th of an inch thick, resisted a pressure of 200 lbs. to the square inch. For locomotive and marine boilers, where the liability to accident is so great, the superior strength of the new material is of great importance.



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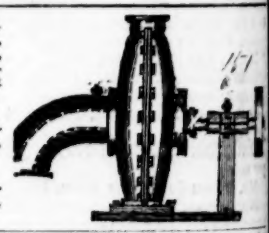

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